REMARKS

Claims 8 and 10-15 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Patent No. 6,342,293 to Nakahara et al. Claim 9 stands rejected under 35 U.S.C. §103(a) for obviousness over the Nakahara patent in view of U.S. Patent No. 4,371,513 to Sanchez et al. Claims 8, 10, 11 and 15 stand rejected under 35 U.S.C. §103(a) for obviousness over EP 0 934 905 to Asaoka et al. in view of the Sanchez patent. Applicants respectfully traverse these rejections for the following reasons.

The present invention is directed to alumina hydrate particles and their inclusion in a sol, coating liquid and recording sheet as well as a process for preparing alumina hydrate particles. The compositions set forth in claims 8 and 10-15 include particles of:

$$x\ M_2O \cdot y\ (NH_4)_2O \cdot Al_2O_3 \cdot z\ H_2O$$

where x, y and z are defined as follows:

$$2 \times 10^{-4} \leq x \leq 25 \times 10^{-4}$$

$$0.1 \times 10^{-4} \leq y \leq 20 \times 10^{-4}$$

$$0.6 \leq z \leq 2.5$$

These particles include ammonia in the form of $(NH_4)_2O$. The $(NH_4)_2O$ is important for printing properties such as decoloration and sol properties, such as the stability of the sol, its viscosity and transparency. The $(NH_4)_2O$ can be introduced into the alumina hydrate particles by using ammonia or the like in (1) neutralizing an aluminum salt, (2) washing a separated alumina hydrogel, and (3) adjusting the pH of the aging alumina hydrogel. The Nakahara patent fails to suggest a selective use of ammonia or the like in alumina hydrate particles.

In rejecting claims 8 and 10-15 over Nakahara, the Office Action acknowledges that Nakahara fails to disclose the alumina hydrate of the present invention having the ammonia range required in claim 8, namely where "y" is 0.1×10^{-4} to 20×10^{-4}. The Office Action asserts that it would be obvious to include the claimed ammonia content in the alumina hydrate of Nakahara because "the mol range of ammonia is optimizable". However, nothing in Nakahara would motivate one skilled in the art to "optimize" any content of $(NH_4)_2O$ in the alumina hydrate

described therein. Nakahara discloses preparing an alumina sol by stirring a dispersion of alumina hydrate at a solid content of 1 to 40 wt. % and a pH of 7 to 12, with an effective consumptive power of at least 0.5 kW/me to aggregate the dispersion. An acid is added thereto to peptize the dispersion. Nakahara describes adding an alkali to adjust the pH of the alumina hydrate to a range of 7 to 12. Several alkalis are described as being useful for adjusting the pH of the alumina hydrate dispersion and these include preferably, sodium hydroxide, potassium hydroxide, sodium aluminate or potassium aluminate. While ammonia appears in a long list of components which may be used to adjust pH, there is nothing in Nakahara to suggest a final alumina hydrate particle composition that includes $(NH_4)_2O$ in the specified amount of the present invention.

In fact, at column 5, lines 34-35, Nakahara describes purification until the ion conductivity of the filtrate becomes at most 100 μS/cm after aggregation and before peptization. This low ion conductivity evidences the absence of the claimed ammonia content and a teaching to actually minimize the ammonia content (remove ions) via purification. As such, Nakahara teaches away from the ammonia content of claims 8 and 10-15. Accordingly, claims 8 and 10-15 define thereover.

The rejection of claim 9 relies on the Nakahara patent, in combination with selected teachings of the Sanchez patent. The Office Action asserts that one of ordinary skill in the art would modify Nakahara to include a filtration and washing step because "Sanchez teaches the filtering and washing are conventional as shown by Sanchez at col. 9, lines 25-40 to remove impurities". Despite the common use of filtration and washing in many processes, Applicants respectfully traverse this rejection as those conventional steps do not account for the deficiencies of either Nakahara or Sanchez to suggest the process steps of claim 9 in producing alumina hydrate particles.

Sanchez discloses a process for preparing alumina including the steps of:

(1) forming boehmite crystal seeds at acidic pH in very dilute aqueous systems;

(2) precipitating and crystallizing the alumina at a pH of about 7 to 8 during which time crystallites of boehmite or pseudoboehmite grow from the hydrous alumina precipitated onto the crystalline seeds;

(3) changing the pH of the system by adding an alkaline solution to reduce the electrical surface charge on the alumina precipitate, thereby gradually reducing the positive charge of the alumina particles to become essentially 0 at pH 9.4-9.6;

(4) optionally aging the system for a period of time; and

(5) filtering and washing the resulting slurry to remove undesirable electrolytes or impurities.

This process of Sanchez is distinct from that of the present invention. Firstly, the boehmite cystal seeds of Sanchez are formed at acidic pH in very dilute aqueous systems. Sodium aluminate and aluminum sulfate are mixed with the boehmite seeds to precipitate alumina onto the seeds and form an alumina slurry. When the concentration of aluminate solution is diluted, the solubility of solute is lowered. As a result, alumina particles (the sol) precipitate from the aluminate solution. In essence, the precipitated particles result from seed growth. Filtration and washing of the precipitate are certainly necessary to obtain the precipitate. Those processing steps do not affect the composition of the particles; they only provide the particles in a desired physical form after all the chemical process steps are complete.

In contrast, the method of the present invention produces an alumina hydrogel by neutralizing an aqueous solution of alkali metal aluminate and/or an aqueous solution of alumina salt. Claim 9 is amended to clarify a result of the filtration and washing step, namely to achieve a desired content of alkali metal. Support therefor appears at least at page 13, line 25 to page 14, line 3. Sanchez provides no motivation to wash and filter a composition so as to control the alkali metal content. Claim 9 is also amended to specify the ion conductivity of the intermediate alumina hydrogel (as disclosed at page 14, lines 16-18) upon washing with ammonia (disclosed at page 14, lines 6-8). As noted above, Nakahara teaches

away from the claimed high ion conductivity (10-1000 μS/cm), and Sanchez does not account for that deficiency. As such, the production of alumina sol in Sanchez is clearly distinct from the process of the present invention and does not in combination with Nakahara suggest the process of claim 9 as amended. Accordingly, claim 9 is believed to define over the prior art.

The rejection of claims 8, 10, 11 and 15 over the combined teachings of EP '905 and Sanchez are traversed for the following reasons.

EP '905 fails to describe particles of alumina hydrate having a pore diameter of 15 to 30 nm at a concentration of 0.3-1.0 ml/g. While EP '905 describes a pore radius maximum of 90 to 120 Å or 9 to 12 nm at [0035], Table 1 reports pore volumes for diameters up to 10 nm (50 Å radius) and maximum pore diameters of 20 nm (102 Å radius). With a maximum pore radius of 20 nm or less, EP '905 teaches away from the claimed 0.5-1.5 ml/g volume of pores sized 15-30 nm in diameter. In addition, EP '905 fails to suggest the inclusion of ammonia in the amount required by claims 8, 10, 11 and 15. The teaching of Sanchez to harden particle exteriors with ammonia does not account for the deficiencies of EP '905 to suggest the claimed alumina hydrate particles with a specific ammonia content. Accordingly, claims 8, 10, 11 and 15 define over the combined teachings.

In view of the foregoing, reconsideration of the rejections and allowance of claims 8-15 are respectfully requested.

Respectfully submitted,

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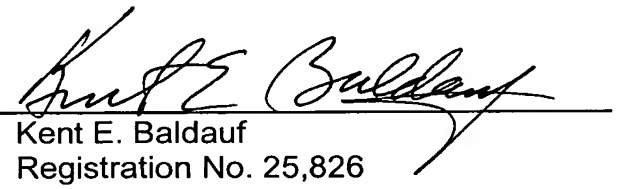
By 

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